REPORT

OF THE

JOINT SPECIAL COMMITTEE

ON THE

OPERATIONS OF THE FISH DEPARTMENT.

HARRISBURG:
LANE S. HART, STATE PRINTER.
1878.

REPORT

OF THE

JOINT SPECIAL COMMITTEE

ON THE

OPERATIONS OF THE FISH DEPARTMENT.

HARRISBURG:
LANE S. HART, STATE PRINTER.
1878.


VIRTUE
LIBERTY AND
INDEPENDENCE

REPORT

OF THE

JOINT SPECIAL COMMITTEE

ON THE

OPERATIONS OF THE FISH DEPARTMENT.

To the Senate and House of Representatives of the Commonwealth of Pennnsylvania:

GENTLEMEN: On the 22d day of March, A. D. 1877, the following resolution passed the House of Representatives:

"*Resolved*, (If the Senate concur,) That the special committee, consisting of five Senators and seven members of the House of Representatives appointed in pursuance of a concurrent resolution, shall make a full, thorough, and careful examination of the operations of the fish department, and for that purpose shall have power to send for persons and papers, to employ clerical assistance, if necessary, and a competent engineer at such compensation as may be just, to sit at such times and places as may be necessary to ascertain all the facts bearing on the subject, and to report to this Legislature the result of such examination, and what legislative action is necessary and practicable to secure the restoration of the fisheries of the State: *Provided*, That the expenses incurred by virtue of this resolution shall not exceed the sum of two thousand ($2,000) dollars, and shall be paid out of the sum appropriated to defray the expenses of the fish commissioners for the present year: *And provided further*, That if after making the aforesaid examination, the committee shall be of the opinion that a suitable fish-way can be constructed at the Columbia dam, or the existing fish-way, at that point can be changed to enable the fish to overcome the said dam, the said committee are hereby authorized to determine the plans of said fish-way, and thereupon the Board of fish commissioners are hereby authorized and directed to construct such fish-way or change the existing fish-ways, in accordance with the plans that may be adopted by the said committee: *Provided*, That no alteration or change shall be made in any dam under the provisions of this act, except with the consent of the owners thereof."

The resolution was concurred in by the Senate on the following day, and received executive approval on the 4th day of April ensuing.

Under the provisions of the resolution, a committee was duly appointed by the Speakers of the Senate and House of Representatives, respectively, which shortly afterwards met jointly in one of the committee-rooms of the State Capitol, and organized by selecting Joseph H. Nisley, of the House of Representatives, as chairman, and E. D. Yutzy, of the Senate, as Secretary.

An Expression of Sentiment Invited.

As the subjects of investigation were of vital importance to a very large portion of the citizens of the Commonwealth, due measures were taken, through the agency of the newspapers and otherwise, to invite an expression of public sentiment upon the several matters embraced within the sphere of the committee's inquiries, and the result was the appearance of a large number of people, who were either practical fishermen or directly interested in fisheries, from whom much important information was obtained, and many of those suggestions subsequently proved of great value to the committee while pursuing their investigations.

The Sessions of the Committee at Harrisburg.

The business transacted at the several meetings of the committee at Harrisburg, during the session of the Legislature of 1877, was, in fact, almost entirely devoted to the hearing of evidence derived from the personal experience of people interested in the fisheries of the Commonwealth, and the earnestness with which all imparted their testimony, together with the large throngs of auditors which the investigations of the committee attracted, showed, with unerring certainty, that the questions involved were of the very gravest public importance.

The matters chiefly investigated at the meetings of the committee in Harrisburg, were the alleged destruction of fish by impurities from tanneries and saw-mills, the obstruction in the Susquehanna river caused by the dam at Columbia, and the alleged inefficiency of its fish-way to answer the purpose of its construction.

The Alleged Impurities from Tanneries.

The first of these subjects elicited considerable discussion, *pro* and *con*, from gentlemen engaged in these great industrial pursuits, and others interested in the conservation of the fish streams of the Commonwealth. The arguments on both sides were ably handled and ingenious, showing much study, by observation and experience, on the part of the disputants; but we regret to say that they were not of a sufficient definite character to enable the committee to arrive at a final conclusion in the premises.

It is a conceded fact that lime and a solution of tanin is injurious to all kinds of fish, and as these two substances form the largest bulk of the

offensive matter discharged by tanneries, it is assumed that they must necessarily impair the fishing qualities of the streams upon which these industrial establishments are situated. Scientific investigation, however, has proved it to be a great mistake that these or any other deleterious substances pass down a stream in their pure form. Chemical changes of surprising rapidity are constantly going on. These impurities are almost immediately precipitated or, by combination, neutralized. The power of streams to work themselves clean is a well established fact. Some fifteen years ago the citizens of Philadelphia were much excited over the alleged impurity of the Schuylkill river water, caused, it was said, by the offensive matter discharged from the manufacturing establishments situated at and in the neighborhood of Manayunk. A commission of able chemists was appointed by the city to investigate the matter, and the result of their labors was to prove conclusively that the impurities from these establishments were lost at very short distances below the points at which they were discharged into that stream. So, also, analysis of samples of the water of the Merrimac river, in Massachusetts, taken a short distance below the extensive Lawrence mills, and at a time when the impurities from the dyeing and print-works were supposed to be at a maximum, gave only from three to five grains of solid matter to the gallon, consisting, not of concentrated poisons, but chiefly of harmless salts of iron and ammonia. When we add that a gallon of common well drinking water contains about sixteen grains of solid matter, a sufficient idea may be obtained of the relative purities, so far as this point is concerned. But we are not to assume from these facts, that there is nothing in the discharged liquids of tanneries to disgust and drive away certain kinds of fish. The peculiar niceness of some species, trout for instance, show that despite their defective organization in this respect, they have a sense that answers the ends of taste and smell. Nevertheless, one fact of great importance may be derived from these analyses, viz: That if foul water can be confined, for a short distance only, to one side of a river, it will be purged of all its deleterious substances, and soon again be in a proper condition to join the main current. In such a case the center and opposite side of a river would at all times be pure.

The Alleged Impurities from Saw-Mills.

In the case of pollution arising from saw-dust, we are inclined to think that the injury from this source has been much overestimated. That it is directly injurious to fish has not yet been clearly demonstrated. An extended observation has not discovered an instance in which fish are known to avoid it. On the contrary, they are often seen advancing, with the greatest intrepidity, through the thickest of a discharge of saw-dust from a mill.

There are, however, other ways in which this substance might, to some extent, be injurious to fish. Great drifts of it settle down upon bottoms

that were before well covered with insects and other small creatures, and destroy life. This might deprive fish of a portion of their feeding ground, and compel them to seek new pastures. It is asserted, also, that it is fatal to the spawn of fish; but, as this refuse matter is, in a great measure, confined to the immediate neighborhood of the mills, and thus leaving large sweeps of the streams uninfluenced by what, at best, might be termed negative effects, to regard these industrial establishments as an active agent in the destruction of fish, we think is not warranted by experience, and any argument in support of such a claim must, necessarily, give way to the patent fact that before the introduction of steam, while the primitive method of water-power was still in general use, and the streams of the Commonwealth were lined with saw-mills, there was a prodigal supply of almost every species of fish; while now, with far less of these industrial establishments run by water-power, there is a remarkable paucity of any kind of fish. It is clear the difficulty lies elsewhere.

The Previous Abundance of Fish.

The allusion we have incidentally made to the previous abundance of fish in the streams of this Commonwealth, suggests to your committee some reflections on this subject, which may serve to show its vast importance to the social as well as the political economy of the State.

From the New York State line, on the North Branch, to the mouth of the river, the distance is about two hundred and sixty miles. From the mouth of Bennet's branch of the Sinnemahoning to Northumberland, is something over one hundred miles. From Clearfield to the mouth of the Sinnemahoning, is about thirty-five miles. From Hollidaysburg to the mouth of the Juniata, is about one hundred miles, and from Bedford to the Raystown branch of the Juniata, the distance is over sixty miles. Sum up the other tributaries, say the Swatara, the Codorus, and the Conodoguinet, at, say, eighty miles, and we have a distance, by the thread of the streams, of six hundred and thirty-five miles. Now, it is fair to presume that there were fisheries at every nine miles of this entire length, which would give over seventy fisheries, which, on the average, must have yielded not less than thirty thousand shad per fishery during the season. Many of them yielded more than one hundred thousand, and in the upper waters they were never fished to one half their capacity. This would give, for the meager fishing of the period, over two millions for the season, and it is fair to presume that, at that time, this single river could have yielded, had it been thoroughly fished, in some seasons, not less than five millions of this delicious fish.

The gradual disappearance of fish in the Susquehanna, notably shad and salmon, was an evil consequence of the internal improvements commenced by the State in 1826, which, if at all anticipated, was overlooked in the general enthusiasm of the people on the subject of cheap and rapid transportation facilities. Of course, the greater interest in opening up the vast

mineral resources of the interior of the Commonwealth, and building highways for their conveyance to market, could not be sacrificed to this lesser interest, and manufacturing prohibited in order that the fish might have unrestricted admission to their spawning beds at all seasons, and the result was that, in order to feed the canals of the State, a series of dams were erected in the Susquehanna river, each of which at once became an insurmountable obstruction to the fish in ascending from the sea to their best and natural spawning beds, far up the head waters of that stream.

The Columbia Dam.

The mischief resulting from these obstructions was fully accomplished before it was generally suspected, and the fish disappeared before a remedy was available. The consequence was that a large amount of money, invested in fisheries above the Columbia dam, was lost, and a number of fishermen financially ruined and impoverished, while many thousands of the poorer class, along the river, who depended almost entirely upon fish as an article of food during winter as well as summer, were compelled to seek other and dearer resources for their maintenance. A striking contrast between the plentifulness of this food during the palmy days of the Susquehanna fisheries and the present time, may be best illustrated by the fact, well known to all the older citizens residing along that river, that an ordinary sized shad, which is now sold during the season at from forty to fifty cents, could then be bought at from ten to fifteen cents.

The State itself seems to have early discovered this disaster to a great interest, and as it had fortunately reserved the right of revoking the charter of the Susquehanna Canal Company, who built the dam at Columbia to feed their canal, in case it acted injuriously to the interests of any portion of the citizens of the Commonwealth, at once demanded, by a supplement passed in the winter of 1838–9, three years after the original charter was granted, that the company should build a sluice, of not less than one hundred feet wide, with an ascent of one foot in five, to promote the passage of fish.

The original charter called simply for a rafting channel with no reference to fish. Whether the company complied with this mandatory act, or whether they deemed the previously constructed raft channel sufficient to answer both purposes, we are unable to say, but that the result was not satisfactory is evident from the fact, that, in 1851, a second mandatory act was passed by the Legislature, requiring the canal company to build sluices for the passage of fish, over which at least one foot of water should always flow. It will be observed from the text of this law in the use of the word "sluices," that the act contemplated more than one opening in the dam, which was evidently done: first, from a firm conviction that the rafting channel was inadequate for the purpose of a fish-way; and second, to preclude the company from regarding that opening as a full compliance with the provisions of their original charter of incorporation. The company, however, appear

to have paid no more attention to this second demand than they had to the previous one, and yet, singular to state, by an act of the Legislature, passed in 1863, the Commonwealth acknowledged and formally accepted the dam as satisfactory in every particular.

This proceeding effectually barred any effort of the people residing on the stream above the dam to compel a modification of that structure, so as to afford at least a partial restoration of the up-river fisheries, for all advantage held by the State in its reserved authority was thus voluntarily surrendered, and what the people might have demanded of the company as a right, would henceforward have to be solicited simply as a favor.

The peculiar situation of the Columbia dam, being the first of the series of this class of obstructions in the Susquehanna, naturally drew to it the obloquy of those interested in the destroyed up-river fisheries, as they regarded that structure as the primal cause of all the difficulty, and this hostile feeling was all the more active and intense, from a knowledge of the fact that the corporation then owning the dam was principally composed of citizens of another State, who were thus permitted, in the construction and maintenance of that obnoxious barrier, to destroy a great public interest of a neighboring people for their own private aggrandizement.

Besides these considerations, the State had reached a period in its history when the object for which these dams were originally constructed had, in a great measure, ceased to be a necessity in the superior advantage presented for rapid transit by the railroad system of the Commonwealth, and there were not wanting many influential citizens who, fully realizing the importance of restoring the fisheries of the State as a matter of grave political economy in furnishing cheap food for the people, even went to the extent of advocating the entire abolition of every canal which depended for its supply of water upon any obstruction that prevented the free and uninterrupted passage of fish.

This sentiment, radical and sweeping as it was, seems to have been, for the reasons we have already stated, particularly manifested against the Susquehanna canal and its feeding dam at Columbia; and this feeling, annually assuming a more tangible shape, at length, in 1865, culminated in a mass convention in the city of Harrisburg, of the leading citizens from almost every county of the Commonwealth watered by the Susquehanna, and its branches north of the Columbia dam.

The proceedings of this body are unfortunately not on record, but when we state that its deliberations were presided over by Honorable Simon Cameron, of Dauphin county, and that many of the four or five hundred delegates present embraced the wealthiest and most intelligent men in the interior of the State, some idea may be formed of the universal and popular feeling in reference to any movement tending toward a restoration of the fisheries of the Commonwealth.

The result of the convention was the passage of an act of the Legislature, then in session, which, after acknowledging in its preamble that, by the con-

struction of a dam across the Susquehanna, shad, salmon, and other fish were prevented from passing up the said stream to the great detriment and injury of persons and communities along said river, the act provided that the several companies owning or interested in dams on the Susquehanna, or on the north or west branches of the same, between tide water and Wilkesbarre on the North Branch, and from Northumberland to Williamsport on the West Branch, were required within six months from the passage of the act to erect such undergates, sluices, chutes, or other devices in all dams, as would permit the free passage of shad, salmon, and other fish up said streams.

The second section provides that if the owners of said dams neglected or refused to construct sluices as would allow the free passage of fish up said river within six months after the passage of the act, they should be liable to a fine of $200, to be recovered as debts of like amount are recoverable by law, one half to the prosecutor and the other half to the Commonwealth.

Notwithstanding the alleged unconstitutionality of this act, by reason of interfering with vested rights, the Susquehanna Canal Company in return for some particularly desirable legislation by which they were authorized to raise their feeder dam not exceeding three feet, consented to comply with its provisions, and accordingly constructed a fish-way from a plan chiefly devised by the superintendent of that company, with some modifications suggested by the fish commissioner of the State, appointed under the act of 1866.

The First Fish-way in the Dam.

The point selected for this fish-way was about one quarter of a mile from the York county shore, where the fish were known to congregate in the greatest number during the season. At this place, a section forty feet long was taken bodily from the dam, on which a new sub-dam was erected, so that its comb, or highest elevation, would about equal the level of the water below the principal dam. The lower slope of the sub-dam was placed at an inclination of one in fifteen, and the sides of the aperture in the main dam were dentated or framed in a series of offsets, so as to promote the formation of eddies in the current passing over the sub-dam. During the fish season in the spring, the water in the aperture was expected to be under the influence of gravity in opposite directions, the lower water seeking to obtain its level, the top of the sub-dam, and the other water rushing through the aperture, would meet and drive it back, but with a force considerably impeded by the cushion, so to speak, of lower water. The fish, while swimming along the foot of the main dam, were expected to find this opening, through which they would endeavor to pass up. If they failed in the first few trials, however, they would naturally resort to the eddies in the recesses at the sides of the sluice, where they would gather strength for a new trial.

Of the merits of this fish-way, your committee have no desire, nor is it

necessary to speak. That it failed to answer its purposes, is evident from the fact that it was abandoned, and a new one constructed a few years afterwards, at a different point in the dam. We have alluded to it, because it was the first contrivance of the kind ever introduced into Pennsylvania, but more particularly to show that in its approval, or acceptance under the act of the fish commissioner, the State lost an opportunity to regain, to some extent, the power it had previously resigned in accepting the dam itself.

The act of 1866, so far as the Susquehanna Canal Company was concerned, was of the nature of a contract; certain privileges were granted in return for certain duties, and until there was a performance by both parties, the contract was incomplete.

The language of the act was, that the company "*should construct a suitable way for the free passage of fish*," and as the contrivance we have described proved to be inefficient for that purpose, it is clear that the company did not carry out their part of the contract.

The mere fact that a sluice was constructed for the purpose of permitting fish to ascend above the dam, necessarily carried with it the implied understanding that fish, if they made the attempt, would be able to make the passage; and as the facts have shown the contrivance was inadequate to permit this, it is equally clear that it was not a "suitable way," within the meaning and intent of the act of Assembly.

Any advantage, however, which this act would have given the State in subsequent negotiations with the Susquehanna Canal Company or their vendees, was, of course, precluded by the action of the fish commissioner "accepting" the fish-way as having been constructed in compliance with the law.

An Additional Fish-way Constructed.

Notwithstanding the unsuccessful results attending the erection of this fish-way, the Legislature of 1873 seems to have had an abiding faith in their efficacy, and by an act creating a board of Commissioners of Fisheries, they were required to erect four additional fish-ways. Owing, however, to the experimental character of the contrivance, the commissioners did not deem it expedient or advisable to expend more of the appropriation than was necssary to construct one. This they placed in the dam at Columbia, opposite a point which they were led to believe was most frequently used by the runs of shad in their ascent of the river.

Plan of New Fish-way.

A number of plans were submitted to the Commissioners for their consideration, many of them patented by their inventors; but, after giving them full and careful consideration, they concluded that in order that a fish-way should be successful as a means of transit for shad, it ought to conform, as nearly as possible, to the natural falls of those portions of the river which they were habitually ascending, in their annual journeys up

the stream; and also that owing to the difficulty presented to the fish in finding the fish-way, if built extending out below the dam, that it ought to be cut in the dam and extend back in the pool above.

The commissioners, it seems, were led to the latter conclusion by the knowledge of the fact that the shad, when stopped by an obstruction like a dam, run along the obstruction seeking for an opening in the obstruction itself. If this is not there, but one hundred feet below the dam, the probability is that few would find it. The commissioners, therefore, decided upon the erection of a single trough, one hundred and twenty feet long by sixty feet wide; to cut this trough into the dam, and run it back into the pool above the dam about one hundred feet; to protect the sides of the fish-way with strong abutments built up on both sides, and to run the water into the fish-way by having the upper end of it sunk two feet below the crest of the dam.

This gives a flow of two feet of water through the fish-way, when the pool above the dam is full, but no water flowing over the dam itself. The inclination of the fish-way is but three and a half feet in one hundred and twenty, so that shad, in making the ascent, would have to rise but one foot in thirty-five. The commissioners were at first apprehensive that the flow of water through the fish-way would be with such increasing velocity, that it would be difficult for the fish to gain access to the fish-way at the lower end. After consultation, however, they concluded, the inclination being so inconsiderable, the increased velocity of the water would be slight, and besides the rapidity of the current would be checked by the water below the dam backing into the fish-way, and thus retard the current at the point the fish would start upon their journey through the fish-way.

Your committee have the more fully described the peculiar features of this fishway because it is now on its trial; and, moreover by the resolution creating the committee it formed one of the leading objects of our investigation.

The Efficacy of the Fish-way.

During the several sessions of the committee in Harrisburg, last winter, this fish-way was the principal theme of discussion; and as the main point to be discovered was its utility and adaptability to the purpose, for which it was intended, only to be shown by the actual passage of fish through the channel, the investigations were confined almost entirely to this branch of the question.

The gentlemen comprising the State Board of Fish Commissioners were present at these meetings, and afforded the committee all the information they could; and while they frankly admitted that the fish-way itself was at best an experiment, they had no hesitation in expressing their firm belief, derived from responsible citizens, as well as by positive experiment, that during their season shad had actually found their way above the dam through that contrivance.

On the other hand, a number of respectable citizens, practical fishermen of long experience, just as positively declared their conviction that the shad alleged to have been taken from the river at various points above Columbia, passed the obstruction at that place through abrasions in the breast of the dam caused by the floating ice during the annual spring freshets. These latter gentlemen directed the particular attention of the committee to the fact that, in the spring of 1875, more than one third of the Columbia dam was prostrated by the ice flood, and during the following season shad were caught with the seine for the first time that year since the construction of the dam, forty years previous. Breaks occurred in the dam in both of the following years, and it was noticeable that shad appeared in the upper river; the number, in fact, seemed to have been governed by the extent of the abrasions in the dam.

It was thus evident to the committee, from the testimony of both parties, that within the last five years shad have annually appeared in greater or less numbers above the obstruction at Columbia, but as to how they made the passage of the dam there exists, as we have shown, a very distinct difference of opinion. There is certainly much reason in the theory of those who maintain that the shad ascended through the abrasions in the dam, especially in the spring of 1875, when it was almost plain sailing over nearly one third of the river, and yet there is no denying the positive evidence of the fish commissioners, that shad have actually ascended through the fish-way. We, therefore, take it for granted that shad have passed through this artificial channel, as they have also been known to pass in more or less numbers through the original sluice made in the dam for the descent of rafts and other river craft, and the only question to be determined, therefore, is whether these valuable fish ascend either one of these artificial openings in sufficient numbers to restore the up-river fisheries to anything like their former prosperity.

The fact that shad return to the place of their nativity is too well established to admit of dispute; but when we are informed that shad have been caught above the Columbia dam, during the last five years, and knowing their exceeding fecundity, we confess that we are somewhat astonished to learn that instead of an increase of these fish, there is a very notable decrease, a fact which can only be explained, (if there is any truth in the "return" theory,) that the fish, in their annual ascent of the river, can either not find the fish-ways, or, by reason of their construction, cannot pass through them.

Do Fish-ways answer their Purpose?

This at once opens up the most salient points of the entire fish-way subject, for upon these features alone depend the usefulness of these modern contrivances for restoring the fisheries in rivers, destroyed by artificial obstructions.

Fish-ways were originally of European invention, where they are only

nsed for salmon, and have generally received the name of "salmon ladders" and "salmon stairs."

That they are well adapted to the wants of salmon, we have no doubt. As an instance of the readiness with which these superb game fish pass up through a ladder, we quote from Mr. Thomas Ashworth:

"I may state that I own an extensive salmon river, where, at about half a mile from the tide-way, there is an insurmountable mill-weir or dam, with a well constructed salmon ladder over it. I have no doubt that forty thousand salmon annually pass through an opening at the top of it only two feet in width."

This is the Galway river, which yields, now, over twenty thousand salmon annually. In the same waters is a most remarkable fish-way. Lough Mark discharges itself into Lough Corrib; but a portion of the intervening lands is so porous that the water disappears before reaching the lower lake. Over this porous ground was laid an iron trough, one thousand feet in length, and of sufficient capacity to carry the water and fish. This leads to the bottom of a salmon ladder, thirteen feet high, and salmon have already passed through this way to the upper waters.

The experience of Europe, however, is not altogether applicable with us. There the streams are smaller, the obstructions lower, and the dams often differently built. We generally have an abundance of water, our rivers are broad, and, in the spring, overflowing and turbulent; but our dams are high, with a heavy, perpendicular fall. Moreover, in Europe there are no shad, which, with us, is the principal fish; while here, at least in the rivers emptying into the Atlantic, we have but few salmon or salmon streams. In several of the Eastern States, particularly Massachusetts, Maine, Connecticut, and New York, fish-ways have been successfully built, but they have been used mostly for the passage of alewives, known in the Middle States as "herring," and sometimes called the shad's youngest brother, excelling that fish, however, in bravery and hardiness. Salmon, of course, pass the fish-ways with comparative ease, but it is singularly noticeable that very few shad make, or even attempt the passage. Indeed, out of fifteen annual reports of fish commissioners, in the States we have named, the fact of the passage of shad through these artificial "ways" is scarcely as well authenticated as the passage of this species of fish through the channel of the dam at Columbia, a circumstance rendered the more astonishing, when we consider that the rivers there are scarcely one half the width of the Susquehanna, thus affording a proportionately less difficulty for the fish to discover the "ways" for their passage through the dams.

The fish commissioners of the States indicated, uniformly ascribe this fact to the natural weakness, shyness, and timidity of the shad. The fish commissioners of this State, in their report for 1873, very frankly confess that "there is not, to-day, in existence, in the world, a fish-way which is known to allow free transit over dams for shad." And again:

"The shad being an exceedingly timorous fish, being halted by fear by the shadow of a bridge, will fail to surmount that which will prove no obstacle to any other of the finny tribes."

With such an array of testimony, and which only accumulates the further investigation proceeds, your committee have very little difficulty in determining this branch of their inquiry, and have no hesitation in declaring their belief that the system of fish-ways, which at present obtains in this country, are entirely inadequate to answer their purpose, so far, at least, as the passage of shad is concerned. They do not mean by this to say that no shad can or do pass over these structures, but if such transits do occur, they are so occasional, and few in number, as to afford no results of great public benefit. Nor is your committee prepared to say that a fish-way cannot be constructed to meet the requirements of this species of fish.

At the meetings in Harrisburg, several very ingenious models were exhibited to the committee, at least two of which might go far towards accomplishing this end, but they were entirely impracticable, because they necessitated a complete aperture in the dam from the coping to the rocky foundation in the river, which, of course, would impair the value of the dam.

The Question of Removing the Dam at Columbia.

It being thus manifest that there was no hope for the improvement of our fisheries through the medium of fish-ways, your committee visited Columbia, with the view of ascertaining if this desirable end could not be accomplished by some other and more effectual process. The project that here suggested itself to the minds of the committee, was the complete removal of the dam, without proving detrimental to the adjoining canal.

This, it was claimed, could be done by an extension of the canal one and three fourths of a mile up the York county shore to Chiques falls; that by the construction of a small wing dam, and possibly without it, a sufficient force and head of water could at all times be secured to feed the canal. Eminent scientific gentlemen looked upon the scheme as feasible, and so deeply was the committee impressed with the value of the suggestion, and the plausibility of the arguments advanced in its support, that they at once gave a practical shape to their investigation by securing the services of Mr. J. C. Sharpless, a civil engineer of much experience, who, by direction of the committee, proceeded to make the necessary instrumental surveys and measurements of the ground for the proposed extension of the canal, as well as the depth of water in the river at the point indicated for its new feeder. The report of this gentleman, together with an accompanying plot of the survey, will be found in the appendix marked A.

Your committee submit this report as simply the opinion of one gentleman who, able as he may be in his professional capacity, is still liable to err in judgment by deceptive appearances leading to wrong inferences, and the conclusions he has arrived at may be successfully combatted by other

equally competent engineers viewing the matter from a different standpoint.

Thus it is claimed by able professional gentlemen that the necessity for a dam at Chiques falls would be entirely obviated by increasing the depth of the canal, which is a point that seems to have been overlooked by Mr. Sharpless. There are other matters advanced in this connection by practical gentlemen which are so strongly impressed with solid reason and good sense, that, notwithstanding the report, your committee still regards the removal of the Columbia dam, and feeding the adjoining canal without erecting any obstructions in the river, as entirely feasible, and practicable, and one that merits profound consideration by the Legislature, as it must be sadly apparent to all who have given the subject a moment's thought, that no effort to restore at least the shad fisheries of the Susquehanna can ever be successful as long as that imposing obstruction is suffered to stand as it were at the very vestibule of that river.

Illegal Fishing in the Lower Delaware and Susquehanna Rivers.

During the last season, your committee had ample facilities afforded them to witness the operations of the shad fisheries in the Delaware river, and found that interest to be in a greatly deteriorated condition, arising from several causes, the most objectionable of which seemed to be the practice of fishing with drift nets in the lower portion of that river. These nets are of peculiar construction, and necessarily very destructive. They are not attached to any particular locality, but are placed across the channel, and are carried along the streams by the tide, often to a distance of fifteen miles, catching all the fish that come within their reach; and when fishing on the ebb-tide, turning and chasing down the river many more fish than are caught, that are on their annual journey to their spawning grounds. The manner of fishing with these nets is thus described by the fish commissioners of New Jersey:

"Their length varies between one hundred and eight hundred fathoms, and they will average, perhaps, three hundred. An enormous sum total is reached of three hundred thousand yards, over one hundred and seventy miles. The largest of these require but one light skiff, with two, or at most with three men to manage them. Being constructed of fine twine, they are almost imperceptible to the fishes in the turbid tide waters. When later in the season the water becomes clear, greater execution is done on this account by fishing at night. The mesh, according to the statement of Mr. Wilkins, was formerly six and one fourth inches, it is now reduced to five and one fourth, and even less; sufficiently large, however, to admit of the shad getting its head so far through the mesh that it is fastened by the gills, hence the term, gill net. These seines have both a lead and a cork line, by which they are held in a vertical position as they drift with the current. With the treble view of economy of material, the prevention of injury by vessels of light draught in passing over them, and to enable the same net

to be used with facility, in either deep or shoal water, the upper margin of the net is supported by long and slender cords of from five to seven feet in length, to the free ends of which corks or wooden floats are attached. The seine thus constructed, is laid upon the stern of the skiff, one or two men, according to the size, row the boat across the current, while another standing on the stern carefully casts the net into the water. This done, it is suffered to drift with the tide, direction being given it by the boat, to which one end remains attached. After the net has drifted a sufficient length of time, the fishes are removed from it, either by underrunning it or by replacing it upon the stern of the boat, again to be cast into the water.

Immediately upon the appearance of the shad in the upper portion of the bay, ordinarily in March, the longest of these seines are there placed to intercept them.

"Fishing continues from Fort Delaware southward until about the 1st of May, when the sturgeon becomes numerous and troublesome, and the shad having pushed their way further upwards, the gilling seines are shortened, and for the remainder of the season keep pace with the shad as they ascend the river. It is not to be supposed from the above that drift-net fishing is confined to the head of the bay or lower portion of the river; on the contrary, from Trenton all the way down the current is literally fenced across at short intervals by these seines."

"From Trenton to a considerable distance down the stream, wherever the depth of water will permit it, and also at certain points upon the upper Delaware, a very objectionable practice prevails. The net is stretched across the channel and there staked or anchored for a considerable time, after which it is loosed and allowed to drift. It has been stated by reliable persons in gill fishing, that in fair weather from two to three 'slacks' are taken daily, the nets laid off on the flood-tide an hour or two before high water, and fished till two or three hours after high water. So, too, on the ebb, the net being laid off two or three hours before low water and taken out an hour or two after ebb tide; thus on an average over twelve hours out of the twenty-four are occupied in fishing. The longer portion of time is during ebb tide; the effect is of course to backen the schools of shad down stream longer and further than they drive them up with the flood."

It is evident, that as long as this wholesale mode of capturing shad is permitted, the largest of the legitimate shore fisheries in the Delaware, must produce slender and unremunerative yields; and the only remedy for this evil is proper inter-legislation on the subject between New Jersey and this Commonwealth.

The same indiscriminate and illegal mode of fishing prevails in the Chesapeake bay, at the mouth of the Susquehanna river; but until the obstruction caused by the dam at Columbia, is either modified or removed altogether, so that the shad can ascend to proper spawning grounds—in other words, until we put our own "house in order," there is very little use in interfering with the domestic economy of those belonging to our neighbors.

Pound Fishing in Lake Erie.

At the earnest invitation of the mayor, city councils, board of trade, and other principal citizens of Erie, your committee, in July last, visited that city for the purpose of personally inspecting the mode of pound netting, a process of fishing which was said to be exceedingly destructive in its effects, not only in the immense number of the fish caught, without restraint as to interval between the catches, but in the more important fact that by the peculiar location of the nets, they effectually barred the entrance of the fish into their natural spawning ground in the bay, between the peninsula and the mainland, and thus were practically fast ruining one of the best, and the only fishery which the Commonwealth enjoyed on the lake. Unfortunately, at the time of our visit, the stormy condition of the weather prevented us from witnessing the lifting of any of these nets, but we learned sufficient from the testimony of reliable gentlemen, to be assured that they were of the most offensive character, even exceeding in their destructiveness the drift nets in the lower Delaware and Susquehanna rivers. The practice was the more odious, especially to the citizens of Erie, in the fact that the parties owning these nets were principally citizens of New York, and even Canada, who appreciating the spot, by reason of the contiguous bay being a favorite spawning ground, erected these murderous contrivances, and thus stole from our very threshold, the fish which, by every consideration of right and justice, belonged to the citizens of Pennsylvania.

A short time previous to the committee's visit, the subject had engaged the attention of the courts of Erie county, which decided that this mode of fishing, at the points usually selected by those engaged in the occupation, was illegal, under which ruling most of the nets had been removed, but as the validity of this decision had been disputed for want of jurisdiction, it is manifestly the interest of the Commonwealth to take such steps in the premises, either by its own legislation, or, if necessary, by that of the National Government, as will effectually determine the question.

Opposition to the Present Law.

Your committee have found a violent and wide-spread prejudice prevailing against the present law regulating the modes of fishing. This feeling seems to be universal among the old fishermen, in which they have the sympathy of the masses to such an extent that violations of the law and an utter disregard of its provisions appear to be the rule and not the exception, whilst great difficulty exists in finding any one willing to become an informer, or testify against them. The opposition to the present law and the consequent temptation to disobey it, arise from the fact that the sections regulating the modes of fishing are regarded by many as oppressive and unjust, in at least some of their prohibitions. The principal objection urged against it, (and it is one that certainly has considerable force,) is the failure to exempt from its operations and penalties, or to provide the methods for taking those varieties that are not regarded as game fish and

which require no protection. Prior to the passage of the acts of Assembly regulating fishing, the catching of one variety alone, the fall eel in its annual passage from our fresh water streams to the ocean, during the months of September and October, furnished an article of cheap food to thousands of the poorer classes who are now deprived of this means of support, with the full knowledge that they are taken in a neighboring State, brought back, sold to our people, and the money carried beyond our borders.

Fully impressed with the idea that a change in the present law, permiting eels, catfish, suckers, and other varieties not game fish, to be taken by such methods as will not prove positively destructive to the varieties now being introduced into the streams of the Commonwealth, to be advisable, and a measure that will result in harmonizing the conflicting interests and to a great extent prevent violation of the law, we would earnestly recom mend such legislation as will best secure this end.

The State Hatching Houses.

In the progress of their investigations, the committee visited the State fish hatching houses, near Marietta, Lancaster county, and at Corry, in Erie county. The first named of these establishments has the use of a spring yielding a flow of water equal to three millions gallons per day. The hatching-house itself is claimed to be one of the largest and best constructed in the country. The hatching capacity is over one million of eggs annually, which can be increased with little or no expense to three millions.

The building is one hundred feet in length, by thirty-two feet in width. The water is conducted into the house through a six inch iron pipe; after entering, it flows through a trough running the entire length of the structure, and is cleansed by a number of flannel screens placed at intervals through the boxes. The hatching troughs are placed at right angles to the supply trough, from which they are fed by means of iron spigots an inch in diameter. There are seventeen of these hatching troughs, about eighteen feet in length and fourteen inches in width. The troughs stand in pairs, so that the attendants can easily overlook them by passing on each side through a passage way left for that purpose. These troughs are raised about two feet from the floor, so that a person sitting on a stool can readily examine the condition of the ova when they are hatching. The lower ends of the troughs are an inch below that of the upper end. This gives a gentle current to the water which flows through them. The eggs are hatched upon screens composed of wire rods, arranged parallel to each other with spaces of about one eighth of an inch and held in their places by wire fastenings. The committee found the establishment in excellent condition, and were impressed with its importance as an auxiliary in the great work of re-stocking the streams of the Commonwealth with food fish.

The hatching-house at Corry, although not so imposing in its dimen-

sions, and not so fully improved in its surroundings, as the one near Marietta, from the fact of its being yet in its infancy, having been established but a few years ago, nevertheless bids fair to equal, if not excel it, as it has many advantages which the latter establishment does not possess. It was found to be in like good condition, and performing the same valuable office to the general public.

The fish are distributed to localities making application early in the season, and giving information in reference to the nature and size of streams for which they are intended, as follows: Black bass, from September 1 to February 1; California salmon, from November 1 to January 1; brook trout, from February 1 to May 1; lake trout, from February 1 to April 1, and land-locked salmon, from March 1 to April 1.

Conclusion.

Your committee have thus gone over the several subjects which they were directed to examine into by the resolution under which they were appointed. They have endeavored to present the results of their conclusions in as compact a manner as possible, without coloring the subject with glittering theories that will not bear the probe of practice. Their object has been rather to give a simple relation of facts as they have found them to exist, whether time honored by experience, or the result of modern skill and ingenuity; and that these may be of service in guiding future legislation upon this important subject is all that your committee can wish for.

The committee recommend the adoption of the following resolution, viz:

Resolved, (If the Senate concur,) That two thousand copies of the report of the joint special committee on the operations of the fish department be printed for the use of the Senate, and six thousand for the use of the House of Representatives.

All of which is respectfully submitted.

JOS. H. NISLEY, *Chairman.*
HARMAN YERKES,
A. H. DILL,
G. V. LAWRENCE,
A. H. DUNKEL,
E. D. YUTZY,
JAS. FOSTER,
A. I. ACKERLY,
E. J. McHENRY,
D. H. SHEIBLY,
GEO. H. ETTLA,
JOHN B. GEMMILL.

"A."

WEST CHESTER, *October 25, 1877.*

Honorable JOS. H. NISLEY, *Chairman of Committee.*

DEAR SIR: On the 9th instant in fulfillment of an engagement made with you, I entered upon an examination of the western shore of the Susquehanna river, between Wrightsville and Marietta, with a view of ascertaining the practicability of extending the tide water canal, and dispensing with or opening the Columbia dam, in order to give free passage to the fish to the upper waters of the river.

To accomplish this it was necessary to make an instrumental survey of the shore, and measure the depth of water at various places in the river, by sounding its bed. A transit line, with distances measured, was first established near the shore from Wrightsville to what is called the "Point," opposite the mouth of Chiques creek, as preliminary.

A line of levels, commencing with the top of the miter sill of the guard lock of the tide water canal as a base, was continued along the west side and carried across the river to the eastern shore, including such points as were necessary on that side of the river.

Soundings on two different lines, were carried entirely across the river, and on another, from the eastern to the deep water in the channel. Several other lines extending some distance from the same shore were sounded, and, on the western shore of the river many soundings were taken in the neighborhood of "the Point," as well as along that shore from the Point to Wrightsville, at distances of one hundred feet apart.

The elevation of the surface of the water in the river was ascertained, and notes of its height on different days carefully kept. From the best source of information I could obtain, the height of low water at the Point was fixed.

From comparing the soundings with the ascertained elevation of low water it was found that boats could not be towed in safety across the river in its present condition, when the water is at its lowest stage. This will be seen by referring to the map. The figures in small circles show the depth of water when the river is at its lowest stage, as compared with the mark used.

The rocks in the river bed are so numerous, that the construction of a channel, through which boats could cross the river in safety, may be regarded as almost, if not quite, impracticable. It would involve heavy cost, and there would be great danger of accidents to boats, unless great care were exercised. I am unable to see how boats could make the passage across in safety in any other way than by the construction of a dam, reaching the entire distance across. A wing dam has been suggested; but, in my judgment, when the river is low, and the current slow, it would not be effectual. When the river is high, and the current rapid, it might check its passage, and raise the surface of the water to some extent, but at such time it would not be needed.

I have, consequently, made an estimate for a dam, four feet above low water, and for a canal, from the "Point" to the guard-lock of the tide-water canal, at Columbia dam—a distance of thirteen thousand four hundred and fourteen feet, or two hundred and fourteen feet more than two and one half miles.

From the end of the present feeder at Wrightsville to the guard-lock at Columbia dam, a distance of three thousand eight hundred feet, the construction of a canal would not be necessary; but the present towing-path embankment has not been constructed with a view of making it water tight, so that I have considered it necessary to puddle it, and have estimated accordingly.

The ground on the west shore being too high for a canal fed from a dam of four feet, without involving much greater cost in excavating its bed, I have chosen to locate it, for the greater part of the way, along the shore, in the edge of the river bed. Even so located, it would be necessary to excavate a large amount of solid rock, which will account, in great degree, for its comparative heavy cost. By raising the breast of the dam, the bed of the canal might be raised so as to cheapen its cost very materially; but the minimum height for the dam has been adopted.

The canal would have two levels: The upper one, six thousand nine hundred feet long; the lower one, five feet lower, to meet the level at the present guard-lock of the tide-water canal.

A guard-lock would be required at the head of the canal, and an opening for the entrance of boats, protected by an embankment extending about five hundred feet above it.

The line selected for the dam is the lowest one on which the soundings are shown on the map. It was taken in preference to the other, for the reason that it is at a greater distance from the proposed line of crossing from the outlet, and would be safer for boats at the time of high water; it is also about five hundred feet shorter, being two thousand feet in length.

The dam proposed would be crib-work, two thousand feet long by twenty-five feet wide, bolted together, and filled with stone or furnace cinder, and covered and sheeted with oak, the filling above it, of stone or cinder, sloping some distance up the river. The estimate provides a chute for rafts, and a feeder for the canal.

The outlet from the Pennsylvania canal is situated one thousand one hundred feet above the dam. The excavation for the lower part of the outlet lock being made in rock, adds very much to the cost.

The cost of the work specified is estimated as follows, viz:

For constructing canal, five foot lock, and guard-lock, . .	$205,124 37
For dam, with chute and feeder, ...	58,727 54
For outlet and outlet lock, ...	22,238 81
	$286,090 72
Add 10 per cent. for contingencies, ...	28,609 07
	$314,699 79

The cost of this work will probably exceed the expectations of your committee. A careful examination, in detail, has shown it to be more than I anticipated. I have taken care not to exceed reasonable limits in the prices of material and work, and I do not think it could be done for less than is here shown. Whether the fish would be prevented from passing up the river by such a dam, I do not feel enough acquainted with their habits to form a judgment; but I would suggest that raising the water in river four feet at low water, might make the danger to damage from high water to Marietta much greater.

Respectfully,

J. C. SHARPLESS,
Civil Engineer.


VIRTUE
LIBERTY AND
INDEPENDENCE

For const
For dam,
For outle

Add 10

The cos
committe
I anticipa
prices of
than is he
up the riv
habits to
river fou
water to


VIRTUE
LIBERTY AND
INDEPENDENCE